ABSTRACT

The rapid expansion of the mobile market over the past few years has seen cellular communications move away from just voice to a host of multimedia services. Users are now demanding their handsets to be packed with more features while at the same time being lighter and more power efficient. As a result, third generation (3G) Wideband Code Division Multiple Access (WCDMA) mobile communications are gearing up to deliver the kind of flexible services wanted. CDMA supports variable bit rates and hence is the ideal mode of communication for future cellular networks. To support various integrated services with a certain quality of service (QoS) requirement in these wireless networks, resource provisioning is a major issue.

Call Admission Control (CAC) is a QoS provisioning strategy to limit the number of connections into the networks in order to reduce the network congestion and call dropping. In previous generation networks such as AMPS, GSM, GPRS, the decision of accepting a new call was a relatively easy one, since the available number of channels in a cell is known. CDMA on the other hand is interference limited and the number of calls cannot specify the capacity of the system. A user will be granted access to the network only if this connection will not cause the other users to experience a drop in quality or affect system stability. In wireless networks, call dropping is also possible due to the mobility of the users, which degrades the performance of the system particularly in future micro/pico-cellular networks.
Call Admission Control and bandwidth reservation are required to address this problem. Since forced call terminations due to handoff blocking are generally more objectionable than new call blocking, the handoff calls must be given higher priority than the new calls. This prioritization can be done by reserving some number of channels exclusively for the handoff calls. In CDMA system this reservation can be done in terms of the interference guard margin (IGM) or signal to interference ratio guard margin (SIRGM). The amount of interference guard margin is to be varied dynamically to improve the connection level QoS parameters such as new call blocking probability ($P_{nb}$) and handoff dropping probability ($P_{hd}$). The over reservation may reduce the handoff dropping probability but it will increase the new call blocking probability. A good CAC scheme has to balance call blocking and call dropping in order to provide the desired QoS requirements.

This thesis analyses the performance of Call Admission Control scheme with mobility based and measurement based reservation in wideband CDMA system. The performance improvement of the Call Admission Control scheme with fuzzy based reservation is also analysed. In wireless systems, due to the user mobility, dynamic QoS requirements and dynamic characteristics of the channel, the Call Admission Controller may not take correct decision based on the measurements. The uncertainty and imprecision problems can be overcome by fuzzy logic, which provides a good solution to the development of a Call Admission Control scheme.